FILE COPY

Stark

RECEIVED
AUG 6 1953
PURCHASING

# THE FAIRCHILD—POLAROID OSCILLOSCOPE CAMERA

## MODELS F-284 & F-286

## INSTALLATION AND OPERATION INSTRUCTIONS

MP MASTER
MA30020

FAIRCHILD CAMERA AND INSTRUMENT CORPORATION
ROBBINS LANE · SYOSSET, LONG ISLAND, NEW YORK

X/12

No. 301-284-2

# THE FAIRCHILD—POLAROID OSCILLOSCOPE CAMERA

## MODELS F-284 & F-286

## INSTALLATION AND OPERATION INSTRUCTIONS

FAIRCHILD CAMERA AND INSTRUMENT CORPORATION
Robbins Lane Syosset, L. I., New York

# OPERATING AND SERVICE MANUAL

## FOR FAIRCHILD—POLAROID OSCILLOSCOPE CAMERA

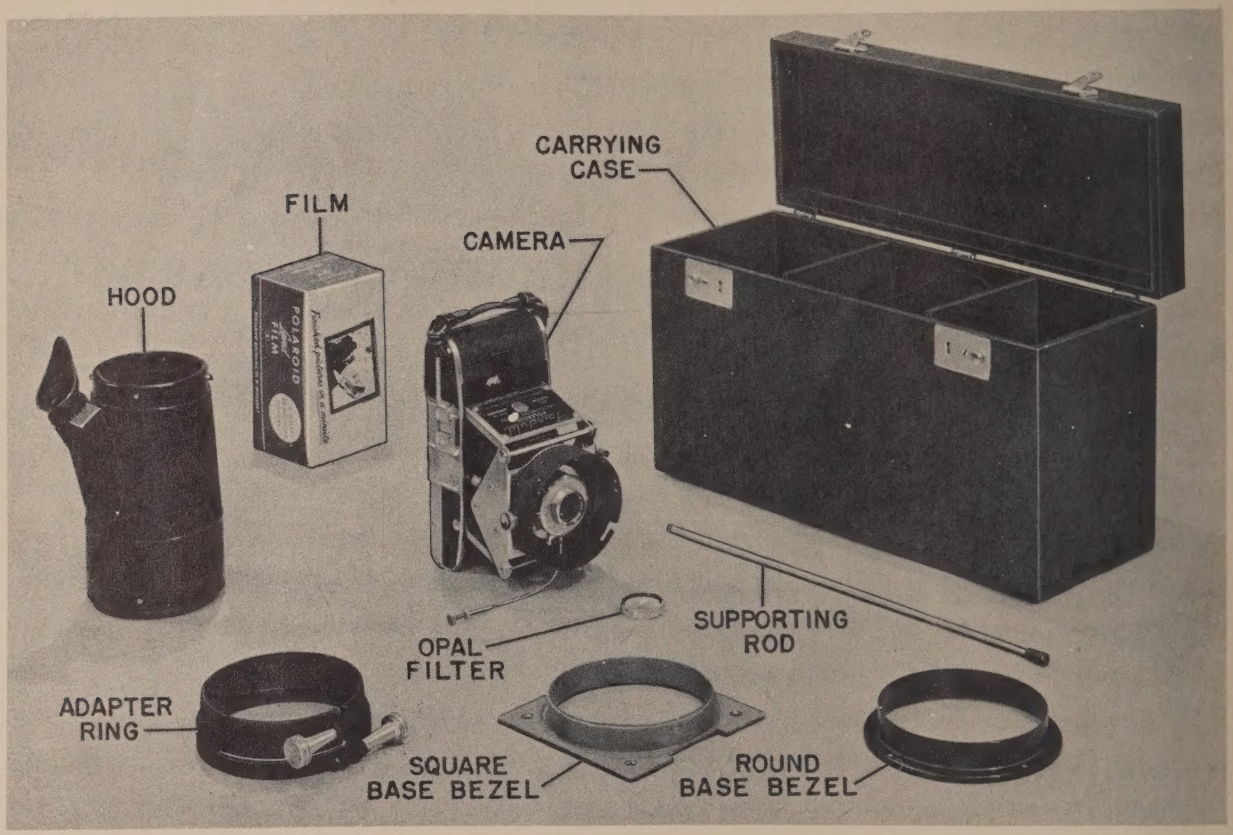


**Figure 1 - Fairchild-Polaroid Oscilloscope Camera**

### GENERAL DESCRIPTION.

The F-284 and F-286 Fairchild-Polaroid Oscilloscope Cameras adapt, for oscilloscope recording, the Polaroid-Land principle of a "photographic print in one minute". They are "still" cameras specifically designed for the following purposes:

(1) To provide a means for economical routine oscilloscope recording which can be immediately evaluated by the engineer or technician without darkroom processing.

(2) For recording single transients or identically repetitive phenomena which appear on the cathode-ray screen. These cameras cannot record continuously changing phenomena that occur over a period of time. (For such applications use the Fairchild Model F-246A Oscillo-Record Camera.)

(3) These cameras supplement but do not replace the Fairchild Model F-246A Oscillo-Record Camera, which provides for continuously moving film recording as well as for single exposures.

The complete Fairchild-Polaroid Oscilloscope Camera consists of the following components:

*CAMERA.* (See figure 1.)-The camera unit consists of a standard Polaroid-Land Camera body which is equipped with one of two specially designed high speed Wollensak Oscillo-Anastigmat lenses of 75MM focal length: Either an f/2.8 lens mounted in a Wollensak-Alphax No. 2 shutter with speeds from 1/25th of a second to 1/100th of a second, "Time" and "Bulb" or an f/1.9 lens which is a little over 2 times faster than the f/2.8 and is mounted in a Wollensak-Alphax No. 3 shutter with speeds of 1 second to 1/100th of a second, "Time" and "Bulb". The focus is fixed at approximately 9 inches thus producing a 2:1 reduction from life size. A special two-position shifting device fitted to the camera body permits two images to be recorded on each photographic print to facil-

itate comparison of two traces and to conserve film.

**Note**

Any number of additional traces may be recorded by repositioning the trace vertically on the screen (see page 9).

*HOOD.* (See figure 1.)-A light-tight hood automatically provides the correct focus for the camera and shields the face of the cathode-ray tube from extraneous light which may possibly fog the recorded image. A viewing port is provided in the hood to permit observing the trace on the cathode-ray screen. A shutter excludes the light when the port is not in use.

*ADAPTER RING.* (See figure 1.)-A single casting fitted with thumb screws is provided to attach the camera quickly, conveniently and firmly to the oscilloscope bezel.

**ACCESSORIES.**

The following accessories are also available:

*SPECIAL BEZELS.* Some variation exists in the outside diameter of the bezels on some of the older model oscilloscopes. The adapter ring described above will fit the 5-5/8 inch outside diameter bezel which most oscilloscopes now carry. For those oscilloscopes having no bezels or having a different outside diameter either the square base or round base bezel may be fitted. (See figure 2 and 3.)

*CASE WITH LOCK.* (See figure 1.)-A substantial case with lock is provided which has compartments to carry all the units described including a dozen rolls of film.

*FILM.* (See figure 1.)-Polaroid-Land film type 41 with an ASA rating of 100 is used. It is a black-and-white film and is sufficient for most laboratory requirements. It is readily available through your local photographic dealer.

*OPAL FILTER.* (See figure 1.)-The opal filter is used for pre-solarizing the film and when used as directed it will triple the writing speed of the camera. (See page 10.)

**MOUNTING.**

The Fairchild-Polaroid Oscilloscope Camera units are designed for ready mounting and removing from the oscilloscope bezel.

*ATTACHING ROUND BASE BEZEL.* The adapter ring may not fit some of the older model oscilloscopes properly. In such cases the present bezel may have to be removed from the front panel and replaced by the round base bezel. In some models the holes in the bezel will have to be slightly elongated, while other oscilloscopes will require locating and drilling holes to mount the bezel. (See figure 2 for details.)

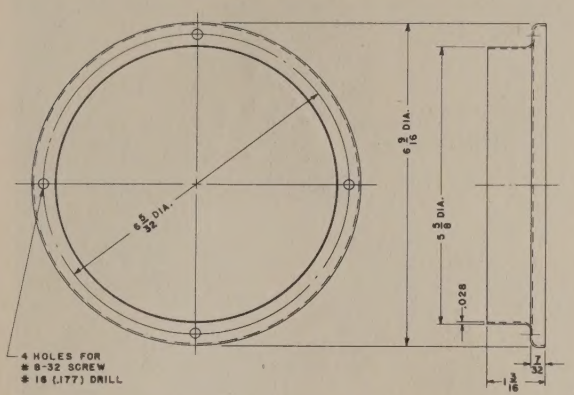


**Figure 2 - Round Base Bezel**

*ATTACHING SQUARE BASE BEZEL.* To attach the square base bezel, simply remove the four knurled nuts that hold the grid and filter in place, slip the bezel on and replace the nuts. For other oscilloscopes adapt as may be necessary. (See figure 3 for details.)

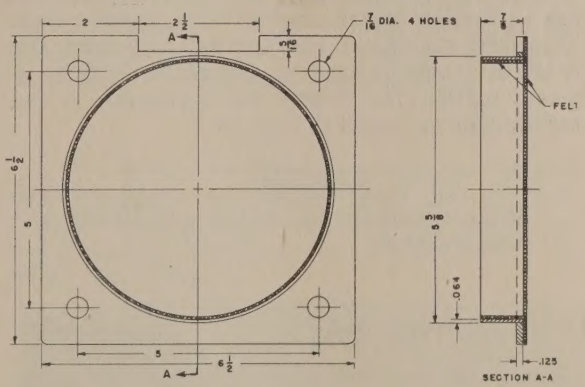


**Figure 3 - Square Base Bezel**

*GRIDS AND FILTERS.* If grids or filters are being used this may prevent the hood from reaching its intended position. This causes a variation of 1/8 inch or more and puts the camera slightly out of focus. If this situation is to continue, remove the rubber ring from the hood and place the metal face of the hood against the grid. However, if the situation occurs only occasionally, and if the intensity of the pattern permits, the lens may be stopped down to f/5.6 or in some cases f/8, or smaller. This increases the depth of field sufficiently to produce a sharp image. (Note: This will also change the 2:1 ratio of the print from the actual image size slightly.)

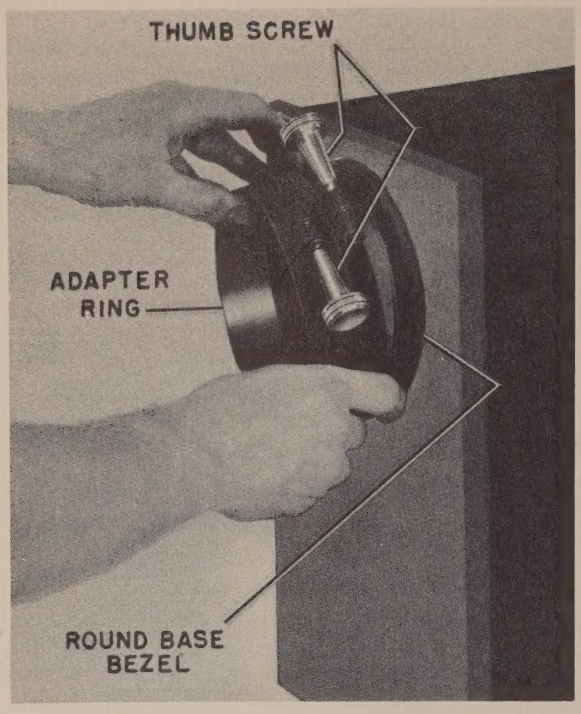


**Figure 4 - Attaching Bezel and Adapter Ring**

*ATTACHING ADAPTER RING.* (See figure 4.)-Loosen thumb screws on the adapter ring. Then slip the larger constriction ring over the bezel, as shown in figure 4, and when properly in place, tighten the thumb screw nearest to the oscilloscope as shown in figure 4.

**CAUTION**

Make certain the face of the cathode-ray tube is clean.

*ATTACHING HOOD.* (See figure 5.)-Slip the large end of the hood into the adapter ring until the lip of the rubber ring is in contact with the face of the cathode-ray tube. (This can be ascertained by reaching into the small end of the hood and feeling.) Now adjust the hood so that the viewing port is on the left-hand side making certain that the metal mask inside the hood is in a horizontal position, and tighten thumb screw, see figure 6. Make certain that the ear of the rubber eye-piece is on the right-hand side.

**Note**

The position of the hood can be rotated 180 degrees to use the left eye, if desired.

*CAMERA.* (See figure 6.)-Lay the camera on its back and remove rubber cup from the foot of the supporting rod. Then pass the supporting rod through the hole in the bayonet lock, through the set-screw assembly beside the shutter and out through the opposite hole in the bayonet lock. Tighten set screw lightly and replace the rubber cup. Now position the camera, as shown in figure 6 and snap the camera on to the bayonet lock on the hood. Loosen the supporting rod set screw as shown in figure 6, and allow the rod to drop to the bench, raise the camera a trifle and tighten set screw on the supporting rod.

**Note**

The camera is adjustable for either of two positions so that two recordings can be made on one print. An over-the-center spring holds the camera in either position, and light pressure on top or bottom will shift the camera from one position to the other.

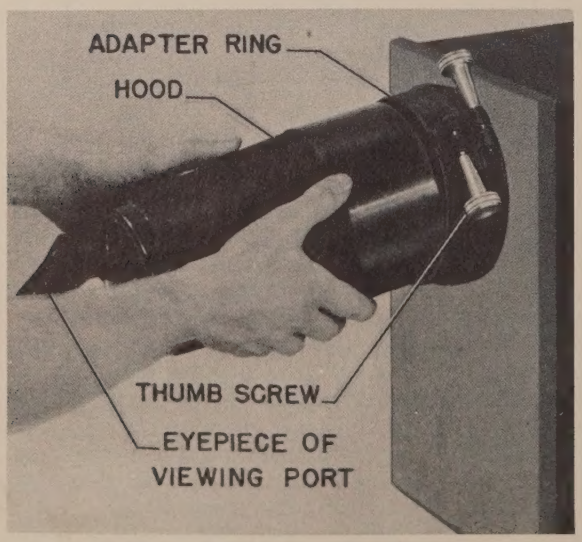


**Figure 5 - Attaching Hood**

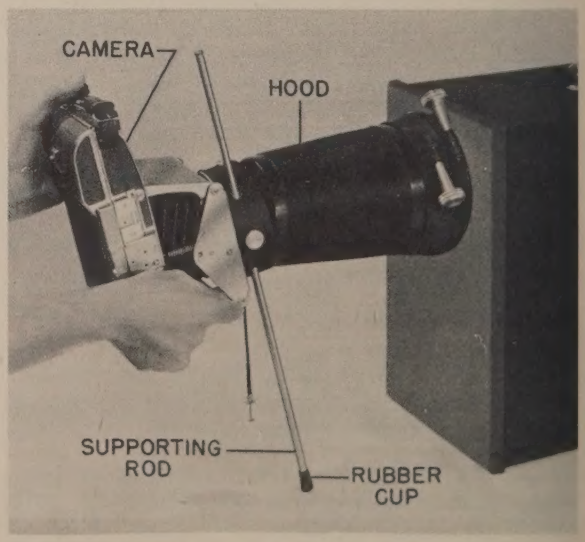


**Figure 6 - Attaching Camera**

**LOADING CAMERA.** (See Figures 7 thru 11.)

A. Lay camera face down, with handle to your left. Lift the cutter bar and open back by swinging the latch all the way down and over. Dust the camera and make sure the two steel rollers are clean. See figure 7.

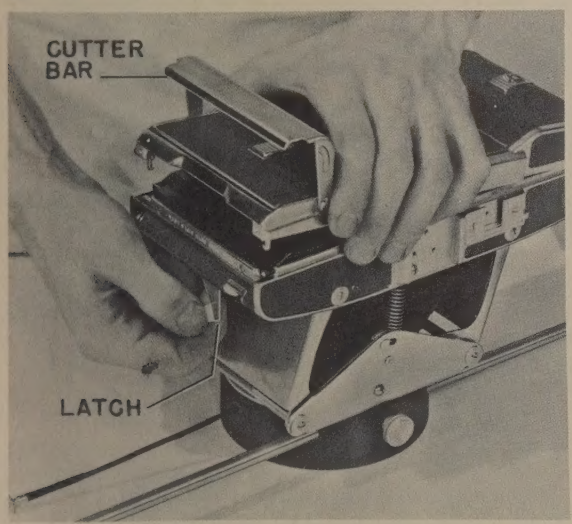


**Figure 7 - Opening Camera Back**

B. Lift the inside cover and lay it back. If camera has been used before, remove and discard empty spool. Unroll film wrapper. (Do not break Scotch Tape seals.) Press spool firmly into holder until it clicks securely in place, at both ends. Drop picture roll into its holder. See figure 8.

**CAUTION**

Never use any film the expiration date of which has elapsed.

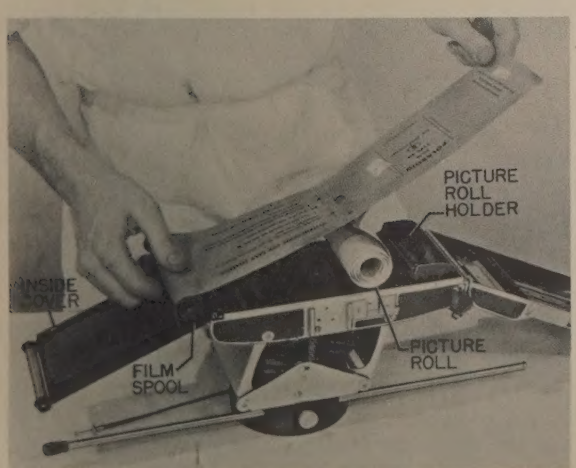


**Figure 8 - Inserting Film**

C. Close inside cover and draw wrapper out until the printed stars on the wrapper appear beyond the roller. Fold wrapper back over steel roller and close inside cover. See figure 9.

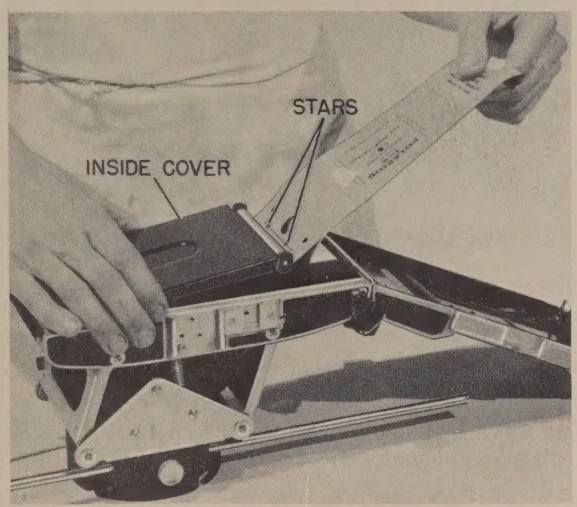


**Figure 9 - Closing Inside Cover**

D. Close camera back, squeeze tightly shut and swing the latch all the way open until you hear a click. Then swing the lock forward to the locked position. Some of the wrapper should protrude when camera is shut. See figure 10.

E. Grasp the protruding wrapper and pull until the paper stops automatically and the word "STOP" appears. Holding down the cutter bar firmly with your thumb, tear off and discard the paper. See figure 11.

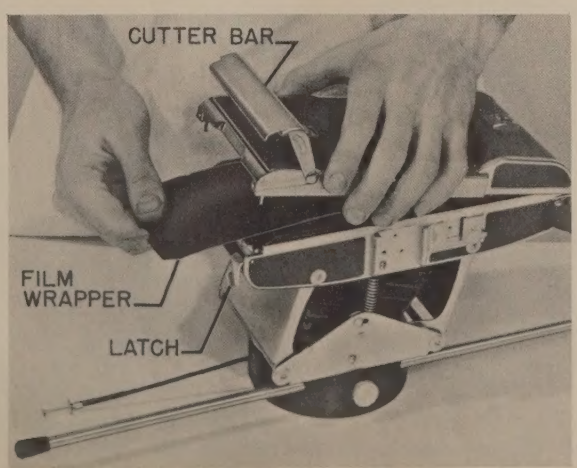


**Figure 10 - Closing Camera Back**

**Figure 11 - Removing Paper Wrapper**

## OPERATION.

(1) Sharply focus the beam of the cathode-ray tube, and bring intensity to the highest point at which sharpness can be maintained.

(2) Set the lens at its' largest aperture.

(3) Set the shutter to one of the following settings:

a. For single transient recordings "B" (bulb).

b. For single transient recording when time of occurence of trace is unknown - "T" (time).

c. Repetitive phenomena (stationary patterns) - 1/25 second.

(4) Position the camera on the hood and rotate the camera onto the bayonet lock.

(5) Position the camera in either the upper or lower position.

**Note**

If the print is not to be duplicated, data may be written on the back or into your note book and the print mounted beside it as soon as removed from the camera.

(6) To record single transients with the shutter set for "B" (bulb) the operator places his eye over the eye-piece, opens the shutter by pressing down on the cable release button and holding it down, awaits the phenomena. As soon as the phenomena has occurred, he closes the shutter, by releasing the cable release button (see figure 12). If the "T" (time) setting is used, push down on the cable release button to open the shutter, push down a second time to close the shutter.

(7) To record repetitive phenomena, the operator places his eye over the eye-piece, and snaps the picture at his pleasure by a single push on the cable release. If a "bulb" exposure is used, proceed as in paragraph No. 6. (See figure 12.)

**Note**

Viewing port should be closed when not in use to exclude all extraneous light.

(8) Apply pressure to the top of the camera until it snaps into its lower position. The camera is now ready for its second exposure.

**Figure 12 - Operating Camera**

## PROCESSING AND REMOVING PRINTS.

(1) The camera may be removed from the hood or left in it's original position when developing and removing prints. If it is desired to remove the camera from the hood proceed as follows:

(2) Remove the camera from the hood and hold the camera as shown. Push the film release button all the way in then release it. Do not hold it down. Then lift the cutter bar. (See figure 13A or 13B.)

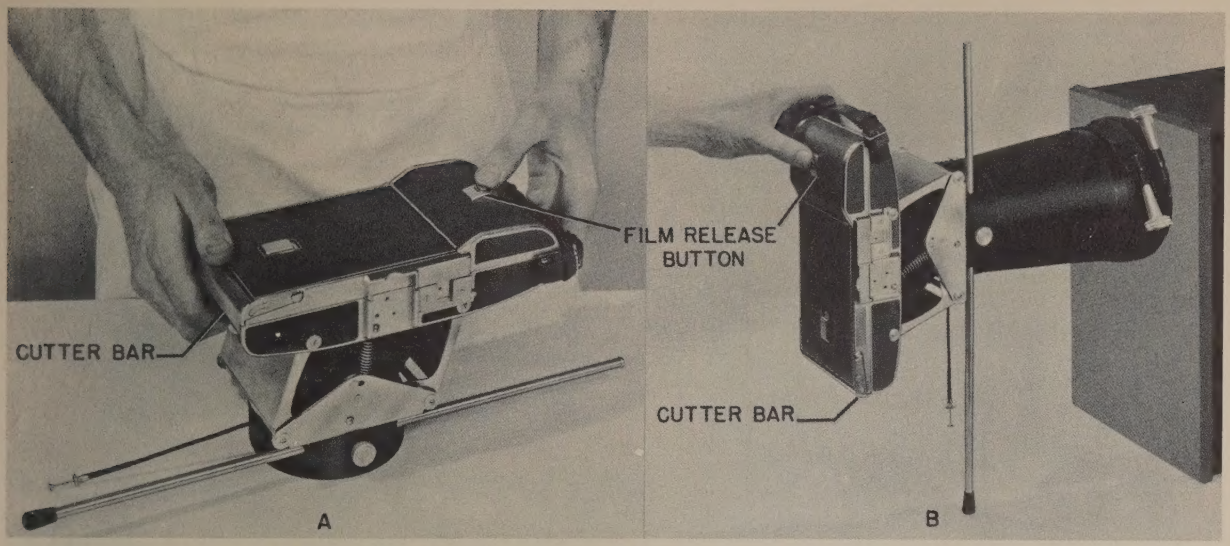


**Figure 13 - Releasing Film**

(3) Pull the tab out of the slot with a single fairly rapid motion until a click is heard. When the click registers, the tab stops automatically. Don't jerk, don't hesitate. Pull tab straight out from camera. (See figure 14A or 14B.)

**CAUTION**

Don't hold down the film-release button while you are pulling a picture as the stop will not hold.

**Note**

Each print is numbered on the back and another number appears under the cutter blade in the left-hand corner of the tab, indicating the amount of film left or used.

(4) Replace the cutter bar and, holding it down with your thumb, tear off paper and discard it. This is the paper negative from the previous picture. (See figure 15A or 15B.)

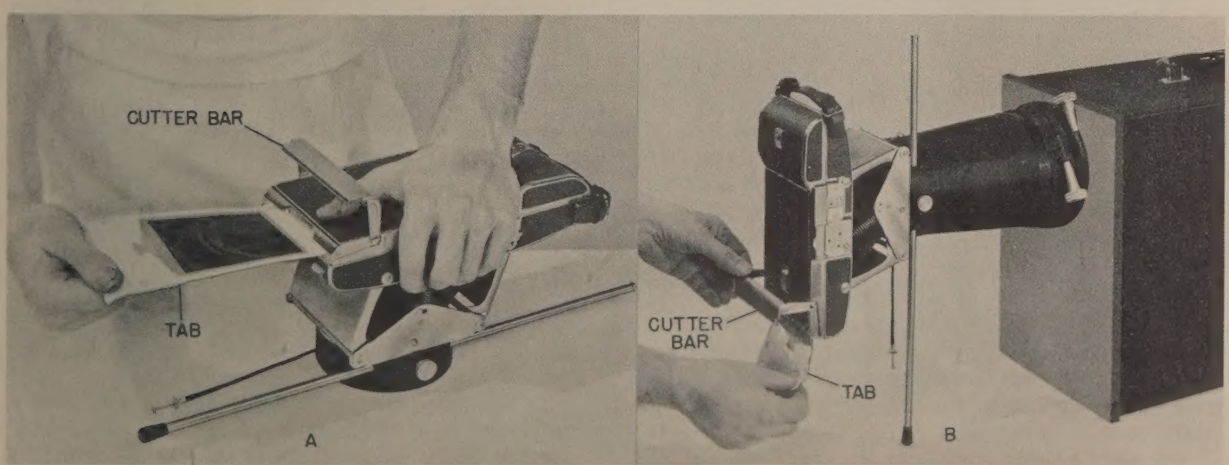


**Figure 14 - Pulling Tab**

**CAUTION**

Don't forget to hold the cutter bar down with your thumb when you tear off the tab (see figure 15A or 15B). If you forget to use the cutter bar you will lose the tab for the next picture. If this happens unlatch camera back and move paper outward.

(5) After about a minute (longer at low temperature - see Exposure Guide that comes with film), open the picture-door by sliding the latch. Remove the picture by lifting carefully along the perforations. (See figure 16A or 16B.)

## PHOTOGRAPHING TECHNIQUES.

### *FACTORS AFFECTING OSCILLOSCOPE RECORDING.*

(1) Set the trace to maximum permissible intensity and sharply focus the trace.

(2) If the pattern is stationary, the exposure can be established to produce the degree of contrast the user prefers. Since the hood is lightproof this exposure can be of any duration.

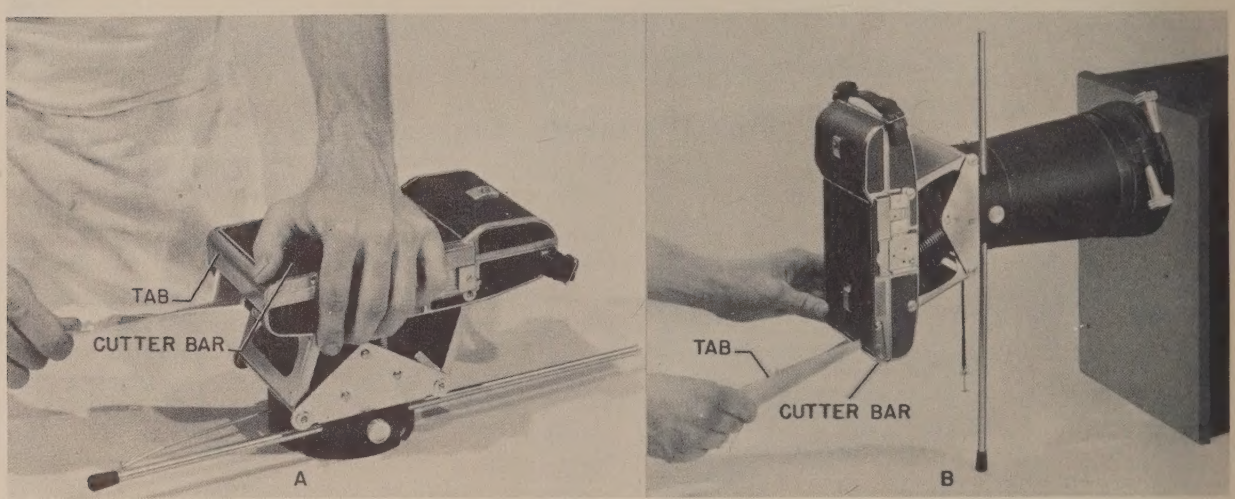


**Figure 15 - Removing Tab**

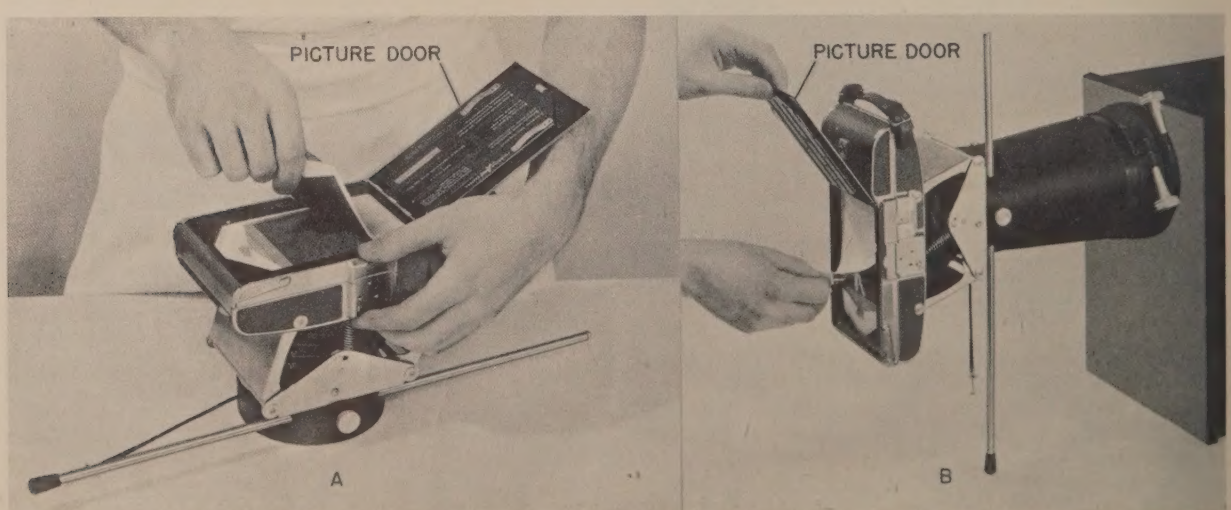


**Figure 16 - Removing Picture**

(3) When the lens is stopped down to f/4, f/5.6, f/8 and so on, the amount of light admitted is cut in half at each stop and the depth of field is increased. Vice versa, the light admitted is doubled as the lens is "opened up" and the depth of field becomes shallower.

(4) Short "time" or "bulb" exposures may be accurately determined by counting the ticks of a wrist watch as follows:

a. 3 ticks for 1/2 second
b. 5 ticks for 1 second
c. 7 ticks for 1-1/2 seconds
d. 9 ticks for 2 seconds etc.

Open the shutter on the first count and close on the last count.

*FACTORS GOVERNING EXPOSURE*

(1) Increasing the intensity of the trace shortens the exposure and increases the top speed of single traces that the camera can record.

(2) The higher the accelerating voltage the shorter the exposure and the higher the top speed of single traces which the camera can record.

**Note**

The curve showing writing speeds versus accelerating potential rises rapidly, especially in the lower voltages. For example: The increase in writing speed between 1.5KV and 3KV is approximately 10 times.

(3) Use of a P-11 (blue) tube requires a shorter exposure and increases the top speed of single transients that the camera can record. Use of a green tube requires a longer exposure and reduces the top speed of single transients that the camera can record.

*BEFORE AND AFTER.* (See figure 17.) This print shows "before-and-after" conditions. The upper trace is a full wave rectified power supply with insufficient filtering. The lower trace shows the same power supply after the addition of a filtering condenser.

*DOUBLE EXPOSURE.* (See figure 18.)-This print shows how the photograph may aid the engineer in evaluation. Instead of making 2 separate exposures to determine how accurately a between-lens commercial shutter operated, the two exposures were "double exposed" one directly upon the other. In the upper picture the shutter repeated almost perfectly. In the lower picture (taken at a higher shutter speed) there is a slight variation between the repeated traces.

**Figure 17 - Before and After**

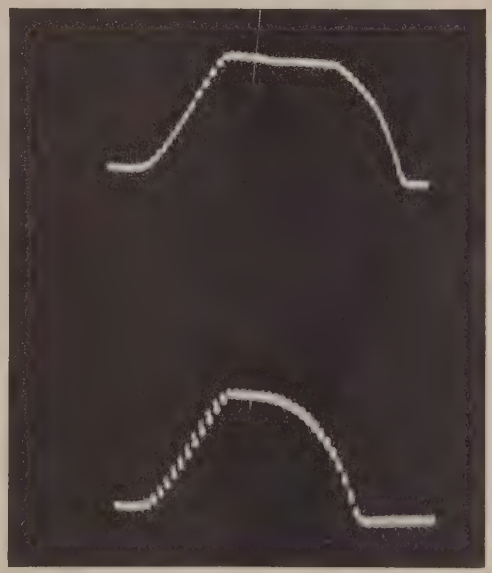

**Figure 18 - Double Exposure**

*SUPERIMPOSING.* (See figure 19.)-This print also shows how the photograph may aid the electronics engineer in evaluation. Instead of making many exposures and carefully measuring each, a number of exposures were superimposed one upon the other.

The closing of the contact of a flash circuit prior to the opening of a commercial between-the-lens shutter are shown. The length of the trace before the shutter opened is a measure of the time between the contact closing and the shutter opening. From these pictures it is possible for the engineer to readily establish the maximum variations.

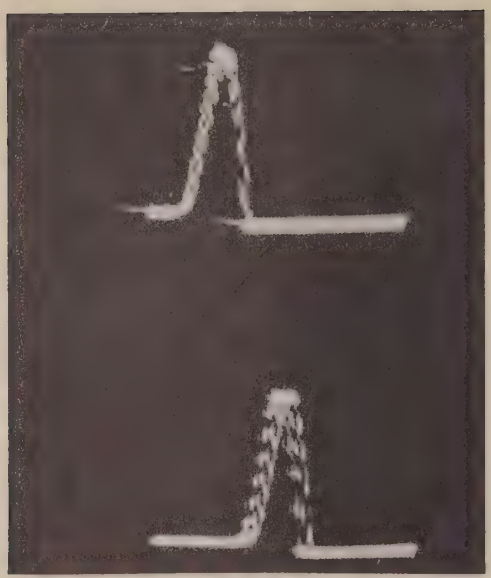

**Figure 19 - Superimposing**

*DOUBLE RECORD.* (See figure 20.)-This photo shows the use of the electronic switch to record two phenomena occurring at the same time. The upper trace shows a normal shutter opening, and the lower trace shows an electric pluse which is timed to occur at the same time.

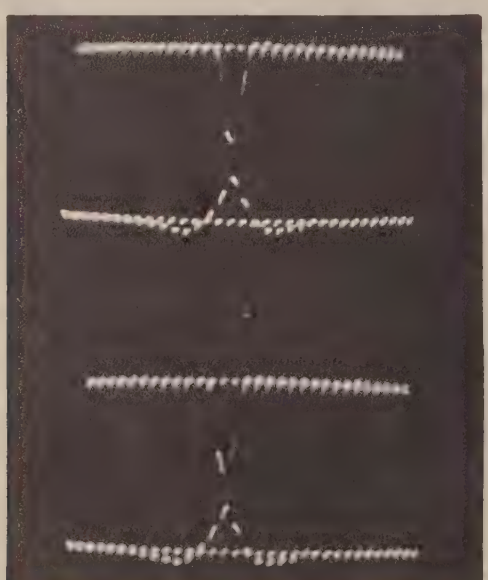

**Figure 20 - Double Record**

*MULTIPLE EXPOSURE AND ELECTRONIC PRE-SOLARIZATION.* (See figure 21.)-These two prints show: (1) that for the sake of economy and for easier comparison, several traces can be put on a single print and (2) that "writing speed" can be increased by pre-solarization. In this case the pre-solarization was accomplished as follows:

(a) Move trace off screen
(b) Completely defocus trace
(c) Turn the intensity to its highest peak
(d) In this particular instance the exposure was approximately 4 seconds at lens aperture f/2.8.

The multiple exposures were made after the electronic pre-solarization. The lens was set at f/2.8 and the shutter set on "Bulb". Then three successive exposures were made without moving the camera. The trace, however, was moved after each exposure. The camera was then re-positioned and three additional exposures were made.

In the upper picture each dot represents .5 milliseconds. The traces show the performance of a commercial between-lens shutter at its 1/100, 1/200 and 1/400 second and 1/25, 1/50 and 1/100 second settings, on the same commercial shutter.

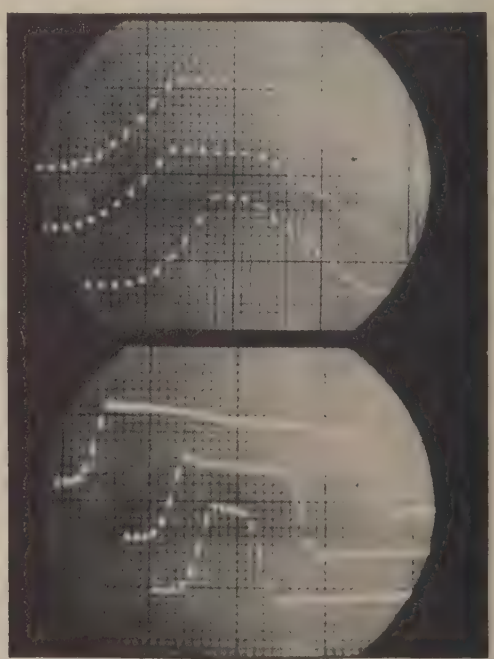

**Figure 21 - Multiple Exposure and Electronic Pre-solarization**

*PRE—SOLARIZATION OF FILM.*

Place the opal filter on the lens and set the lens aperture at f/16 and shutter at 1/50th of a second. Make exposure with the filter in actual contact with a 40-watt frosted bulb (see figure 22). The exposure may have to be varied slightly from the suggested setting to obtain the desired increases in writing speeds.

**CAUTION**

Remove opal filter after each pre-solarization exposure.

**Figure 22 - Pre-solarizing Film**

*PRE-SOLARIZATION.* (See figure 23.)- These two prints show the increased writing speeds by pre-solarization as compared with ordinary photography. Each trace was stopped down one stop starting at lens aperture f/2.8 and as shown on the pre-solarized print the writing speeds increased four times.

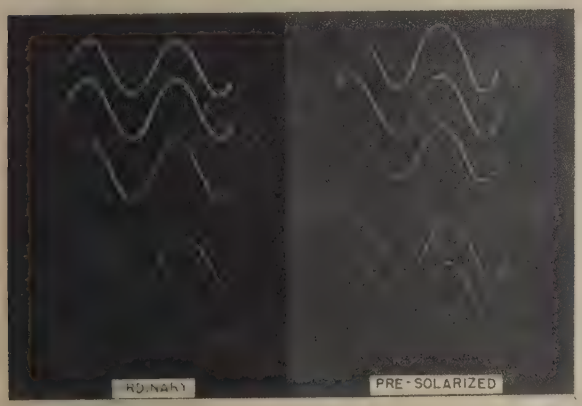


**Figure 23 - Pre-solarization Comparison**

*PHOTOGRAPHING AN ILLUMINATED GRID.*

(1) Set up the camera and photograph the trace as directed in paragraph on Grids and Filters on page 2.

**Note**

When the grid is lighted some specular reflection may occur on the face of the tube. These reflections can usually be eliminated by masking tape or in some instances it may be necessary to use black paint on the cathode-ray tube.

(2) Without moving the camera, remove the phenomena entirely from the screen by turning down the intensity control on the oscilloscope.

(3) Set the grid light at an intensity which will give the desired visibility of the grid on the finished print as determined by trial. Do not change this intensity setting once it is established.

(4) Make a second exposure to record the grid.

**Note**

The grids on most oscilloscopes are illuminated with a red light which is the least active photographically. Hence, the exposure must be two to ten seconds for desired print contrast.

(5) If it is desired to record the grid continuously, then it would be best to remove the red paint from the illuminating light and permit clear light to illuminate the grid, making it possible to shorten the grid exposures materially.

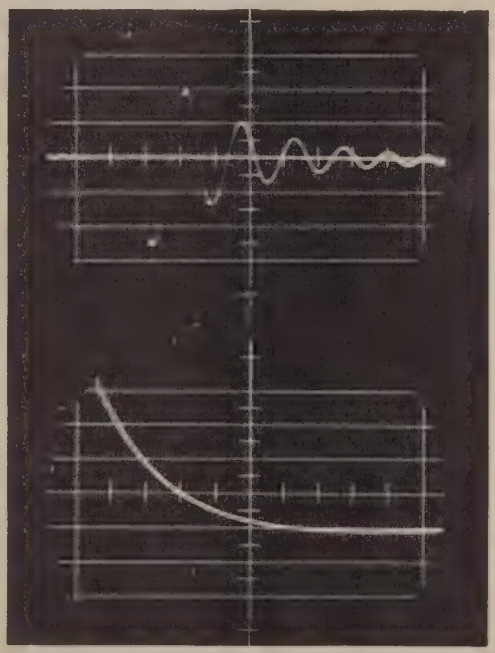

**Figure 24 - Illuminated Grid**

The above oscillograms were recorded using an illuminated grid (red) from a green cathode ray tube. In this case the image of the grid was exposed separately and the trace was superimposed by double exposure.

*PHOTOGRAPHING AN UNILLUMINATED GRID.*

To record an unilluminated grid, throw the dot far out of focus, move it off the screen and turn intensity to the maximum. This produces a low over-all fluorescence on the screen, with which the grid can be recorded (this also pre-solarizes the film to some degree). The trace can be superimposed or double exposed either before or afterward.

*RECORDING FAINT TRACES.*

(1) In occasional instances intensity of single transients which is too low in sensitivity for the Polaroid-Land film to record may be recorded by use of conventional photographic 4 x 5 sheet film.

(2) Any high speed film which is sensitive to both blue and green light may be used, such as Super XX, or Ortho X, by the following darkroom procedures:

(a) Lay camera face down, with handle to your left and open back by swinging the latch all the way down and over.

(b) Lift the inside cover and lay it back.

(c) Take a piece of 4 x 5 sheet film and position the film over the picture aperture.

(d) Close inside cover and camera back and squeeze tightly shut. Then swing the latch to the locked position.

**ADDITIONAL COPIES OF PRINTS.**

Where duplicate prints are required they can be easily made from the original by one of the following methods:

(1) Contact Negative on Paper: The original print can be laid face up on an ordinary photographic printer, and covered with a sheet of contact photographic paper, of the softest contrast possible, either No. 0 or No. 1. The exposure is then made directly through the original print. The resulting copy is a negative reversed right-to-left. From this paper negative prints can be made in the conventional manner.

(2) Contact Negative on Film: These may be made by laying the original print face up in the photographic printer covering it with a sheet of soft film (high speed film, such as Super XX) exposing and developing as usual. The film then becomes the negative from which as many positives as are needed may be made by ordinary photographic contact printing. (Enlargements can also be made from this negative.)

(3) A copy negative may also be made by photographing the original print in the conventional manner.

(4) Copies or enlargements can also be secured through your local photo dealer. (Note: See the directions printed in the folder accompanying each roll of film.)

**PRINT PROCESSING.**

When the Polaroid-Land print is lifted from the Fairchild-Polaroid Oscilloscope Camera, it consists of a true metallic silver image. This image, however, lies upon the surface of the paper with little protection, and may carry traces of the processing oxidants. Therefore, the proper processing calls for two simple steps:

(1) Any traces of the processing oxidants must be removed.

(2) A suitable protective coating must be applied to the print.

These two steps can be accomplished so quickly that the finished print will be ready for use in approximately three minutes after exposure when using one of the following coatings.

**PRINT COATINGS.**

(1) Polaroid Print Coater - This print coater is packaged with each roll of Polaroid film. Its application not only cleans the print and applies a water proof plastic protective coating in a single operation, but also serves as an adhesive for mounting the prints. However, there is a minor disadvantage when using the Polaroid Print Coater, inasmuch as it cannot be dry mounted satisfactorily because the coating itself is a thermo-setting plastic.

For best results in using this print coater, follow the instructions supplied in the package.

(2) Kodak-Print Lacquer - Wipe the surface of the print gently with a slightly dampened soft cloth or sponge, using a new surface of cloth or sponge each time, so as to remove any trace of processing oxidants. The sponge or cloth must be rinsed and wrung out after every 6 or 8 prints. Let the print dry about 30 seconds; then apply an even coat of lacquer, using a good quality camel hair brush, or a sanitary cotton swab. This should dry in approximately one minute.

## MOUNTING PRINTS.

An excellent mounting agent for Polaroid prints is Kodak Rapid Mounting Cement which may be purchased from your local photo dealer.

Polaroid Print Coater may also be used as an agent for mounting.

## CAMERA MAINTENANCE.

(1) Replacing Camera Back - The camera back is replaced according to the following steps:

(a) Drive out hinge pin.

(b) Pull the cutter bar out and swing the latch to the opposite side of the camera.

(c) Remove the camera back.

(d) Install new back by matching up hinges and insert hinge pin.

(e) Swing back closed to check if it seats properly. If not, check to see if hinges match properly.

(2) Replacing Cable Release - When replacing the cable release, a pair of long nose pliers are necessary, and proceed as follows:

(a) Loosen the cable release, if necessary using a pair of long nose pliers, and unscrew it from the shutter.

(b) Remove cable release from the camera support by pulling it down and completely out of the grommet.

(c) Insert new cable release through the grommet in the camera support and up to the shutter. Screw in the cable release.

(d) Then with the long nose pliers tighten the cable release to the shutter.

(3) Cleaning Lenses - Carefully dust off any gritty particles with a soft, clean brush. Then clean the front surface and rear surfaces of the lenses with lens tissue or a soft, clean, dry lintless cotton or linen cloth. If rubbing with the dry cloth is not sufficient, breathing on the lens and wiping gently is suggested. Clean only exposed surfaces of the lens.

(4) Lubrication - Oil all hinges and spring mounting pins with a number 5 machine oil. When applying lubricants, use them very sparingly and take extreme care to remove all excess.

On the roller pivots or bearing points apply a small amount of vaseline and wipe off any excess amount.

## REPLACEABLE PARTS.

The parts listed below may be purchased as spare parts and easily installed in the field.

| Nomenclature | Part No. |
|---|---|
| Cable Release | 692-53 |
| Spring - Over Center | 692-65 |
| Spring - Balancing | 692-55 |
| Eyeguard | 851-210 |
| Filter - Opal | 692-50 |
| Shield - Light | 692-20 |
| Hood - Tubular | 692-A4 |
| Hood - Scope Tube | 692-34 |
| Ring - Clamping | 692-1 |
| Screw - Thumb Lock | 692-2 |
| Washer - Plain | 692-3 |
| Rod - Supporting | 692-27 |
| Screw - Locking | 692-60 |
| Pin - Locking | 692-61 |
| Sleeve - Locking | 692-62 |
| Socket Tip - Rubber | 692-33 |
| Camera Back | 692-67 |
| f/2.8 Lens - Alphax Shutter | 692-31 |
| f/1.9 Lens - Alphax Shutter | 692-63 |
| Carrying Case | 692-43 |

MP MASTER
MA30020